

## Serially Controlled Calibrations - Environics

### 1.0 General

The CPP supports the control of instrument calibrations and also controls calibration instruments, such as mass flow controllers over their serial ports. Calibrations are all tied into the digital output bits of the CPP. As described in the CPP manual, digital I/O bit settings apprise the CPP when an instrument is measuring the sample input, the zero input or the span input. These bit settings can be used to drive relays, which control solenoids, which switch the various gases into the instruments.

In addition, the serial control of calibrations can be tied to the digital output bit transitions. Upon sensing the setting or resetting of digital output bits, the CPP can be set up to send command strings to instruments and to calibrators. To set up serial control of calibrations, from the Main Menu select the calibration set up. The CPP responds with:

```
Line 1      Number of Spans = 1<cr>
Line 2      Digital(D) or Serial(S) = S<cr>
```

As discussed above, the digital path allows bit settings to apprise the CPP of the type of input to each instrument. As an example, digital output bit #30 being set true indicates that the SO<sub>2</sub> analyzer (on CPP channel #02) is in the zero mode. Digital output bit #31 being set true indicates that the SO<sub>2</sub> analyzer is in the span mode. These digital outputs can be used to directly drive solenoids, or to start sequences, or set concentration levels inside calibrators that control and conduct instrument calibrations. The digital output bits can also be used to send strings to instruments and calibrators.

In addition to using the digital outputs of the CPP to drive solenoids, the CPP can be configured to sense transitions of digital output bits, and to send serial commands to instruments to close solenoids and to start calibration sequences. The calibration bit assignments in the digital path must still be set up as before.

The CPP can be set up to simultaneously control calibrations with relay closures, control calibrations with serial commands, or sense contact closures as calibration indicators. Prior to initializing the serial calibration features, the channels must be set up in the CPP.

At the bit number question, inputting a bit number followed by a C will clear all serial conditions set up for this particular bit transition. For example, inputting **30TC<cr>** will clear all serial conditions for bit #30 going true. The CPP responds with Bit #30T Cleared.

The commands presented with each question will vary depending on the manufacturer and the type of instrument connected to the channel selected. The following sections address the Environics calibrator.

### 1.1 Environics Calibration Systems

The CPP firmware supports three types of interfaces with the Environics calibrators. One is a digital interface using the digital outputs of the CPP to drive the status input bits of the calibrators. The second uses the status output bits of the calibrator to drive the digital input bits of the CPP. In the third type the CPP sends string commands over the RS-232 port to select concentrations.

## **1.2 CPP Digital Outputs Controlling Calibrator**

To use the digital interfacing, sequencers should be set up in the calibrator that produce the desired concentrations and calibration timing. These sequences can then be invoked by setting up the CPP digital outputs to drive the status input line of the calibrator. The duration of the sequence should be longer than required by the calibration set up, as the sequencers are stopped by the Stop status bit, and not its own timer. The following example provides an indication of how this feature is set up.

### **In Environics**

Sequence #1 set flows and concentrations for zero air  
Sequence #2 set flows and concentrations for span value  
Set status input #1 to Sequence #1  
Set status input #2 to Sequence #2  
Set Status #3 to Stop

### **In CPP (bit numbers and channel numbers are arbitrary)**

Set digital output bit #1 true when channel #01 is in zero mode  
Set digital output bit #2 true when channel #01 is in span mode  
Use digital output bit #3 for Stop command  
Set up a sequencer to output bit #1 - zero  
After zero time, reset bit #1, set bit #3  
After 5 seconds reset bit #3, set bit #2 - span  
After span time, reset bit #2, set bit #3  
After 5 seconds, reset bit #3  
set up the CPP so that the output bits flag zero/span values for channel #01

### **Wiring**

Connect CPP digital output #1 to Environics status input #1  
Connect CPP digital output #2 to Environics status input #2  
Connect CPP digital output #3 to Environics status input #3

## **1.3 Environics controlling calibration**

This approach is similar to that presented above except that the control of the calibration resides in the calibrator. The duration of the sequencers should be set to the desired calibration times.

### **In Environics**

Set up sequencer #01 and #02 as above  
Set up status output bit #1 to sequencer #01  
Set up status output bit #2 to sequencer #02  
Set up timer to start sequences

### **In CPP**

Set up CPP to sense digital input #01 as zero mode for channel #01  
Set up CPP to sense digital input #02 as span mode for channel #01

## Wiring

Connect EnviroNics status output #01 to CPP digital input #01

Connect EnviroNics status output #02 to CPP digital input #02

These are simple examples, but they are indicative of how the digital interfacing operates, and can be readily expanded to more sophisticated applications. The digital output bits of the CPP can also be encoded to drive the "Sequence Group Binary Status Input Bit Sensing" of the EnviroNics, as well.

### 1.4 RS-232 Controlled Calibrations

The CPP can be set up to send commands to the EnviroNics calibrators over the RS-232 port. This is accomplished by setting up and saving concentrations in the calibrator, and then having internal flags in the CPP queue up and send strings to the calibrator that invoke the stored concentrations. The internal flags in the CPP are derived from sequencers set up to provide the desired calibrations. Prior to setting up the serial calibrations, some channel in the CPP must be initialized with the EnviroNics 9100 as the channel input. This is required to assign a comm port, Baud rate, and parameter to display for interfacing to the calibrator. A standard DB RS-232, 25 pin female, to 9 pin male, cable is used to connect the CPP to the EnviroNics calibrator.

The CPP can be set up to select any of 90 concentration settings. An example is presented below.

#### 1.4.1 Initializing a CPP Channel As EnviroNics

From the main menu select Channel Set Up, and select the channel number for the EnviroNics 9100 calibrator. After selection of EnviroNics as the channels input, the CPP presents the following parameter selection table.

```
Env Param #  
01 = CONC NOX  
02 = CONC NO  
03 = CONC SO2  
04 = CONC CO  
05 = FLOW MF1  
06 = FLOW MF2  
07 = FLOW O3  
08 = CONC O3
```

```
SETTING = 01<cr>
```

When setting concentrations in the calibrator, the gas concentration numbers should match those presented above, 1 = NOX, 2 = NO, etc. This allows the CPP to request the corresponding parameter for the calibrator for display.

## 1.4.2 Initializing Serial Calibration

The CPP can be set up to select any of 90 concentration settings. An example is presented below.

### In Environics

Set up a zero air concentration, save as concentration 01. Set up a span concentration, save as concentration 02.

### In CPP

Set up digital output bit #30 to indicate that channel #01 is in a zero mode, and digital output bit #31 to indicate that channel #01 is in a span mode. Channel #1 would be the instrument channel number. In the below example, the Environics calibrator has been initialized into CPP channel number 20. Set up a sequence to provide the proper digital output bit settings to conduct the calibration. Going into a zero mode sets digital output bit #30. Exiting the zero mode resets bit #30. Going into the span mode sets digital output bit #31. Exiting the span mode resets bit #31.

	Column #1 - Set Up Zero	Column #2 - Set Up Span
Line 3	Bit # = 30T<cr>	Bit # = 31T<cr>
Line 4	Cmd #1	Cmd #1
Line 5	Chan # 00 20<cr>	Chan # 00 20 <cr>
Line 6	Environics 9100	Environics 9100
Line 7	Command 01-90 = Set Conc XX 91 = Stop 92 = Home Selection = 00 01<cr>	Command 01-90 = Set Conc XX 91 = Stop 92 = Home Selection =00 2<cr>
Line 8	Cmd #2	Cmd #2
Line 9	Chan # 00 <cr>	Chan # 00 <cr>
	Return To Main Menu	Return to main Menu

**Line 3** Asks which digital output bit is to be monitored. The input 30T indicates that when digital output bit # 30 goes true, the following commands are to be sent. Four commands are allowed for the setting or resetting of each bit. If more than four commands are needed, then two bits can be set in the sequence set up.

**Note** - Only one command can be sent to any instrument on a bit change. For example, a command resetting the zero mode and setting the span mode in the same instrument **can not** be sent on the same bit transition. The sequencers must be set up to send the reset zero command, and then set another bit to send the set span command.

**Line 4** indicates that command #1 is being set up. There are four commands available with each bit transition.

**Line 5** asks which channel this command is to sent out. In the example, channel #20 was selected.

**Line 6** The CPP then prints the manufacturer and model number of the instrument initialized in this CPP channel. The CPP prints that it found an Environics model 9100 calibrator in CPP channel #20.

**Line 7** presents a list of commands that are supported for this instrument. This will vary depending on the manufacturer and the type of instrument. In the example, the command to select concentration #01 was selected.

**Line 8** asks for the next command. Here commands could be sent to other instrumentation. The carriage return indicates that nothing else is to be sent based on the digital output bit.

The above directed calibration gases to the instrumentation. The following exits the calibration and shuts off the calibration gases.

	<b>Column #1 - Exit Zero</b>	<b>Column #2 - Exit Span</b>
Line 3	Bit # = <b>30F</b> <cr>	Bit # = <b>31F</b> <cr>
Line 4	Cmd #1	Cmd #1
Line 5	Chan # 00 <b>20</b> <cr>	Chan # 00 <b>20</b> <cr>
Line 6	Environics 9100	Environics 9100
Line 7	Command 01-90 = Set Conc XX 91 = Stop 92 = Home Selection = 00 <b>92</b> <cr>	Command 01-90 = Set Conc XX 01 = Stop 02 = Home Selection = 00 <b>92</b> <cr>
Line 8	Cmd #2	Cmd #2
Line 9	Chan # 00 <cr>	Chan # 00 <cr>
	Return To Main Menu	Return to main Menu

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